APPENDIX C1

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

KEURIG, INCORPORATED, Plaintiff, v. HON. DAVID J. KAPPOS, Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office, Defendant.	CIVIL ACTION NO. 09-2353 (RBW) ECF

RULE 26(A)(2)(B) DISCLOSURE OF TED LINGLE

I. SCOPE OF WORK AND COMPENSATION

I have been engaged by counsel for Keurig, Incorporated ("Keurig") to evaluate claims 1-9, 12-19, and 22-44 of U.S. Patent Application No. 10/658,925 ("the '925 application") in light of my knowledge and experience concerning the process of brewing coffee, and the development of "single-serve" systems like those sold by Keurig.

In particular, I was asked to assess certain factors that I understand from counsel to be relevant under 35 U.S.C. § 103 for determining whether or not the '925 patent application claims "would have been obvious at the time the invention was made[1] to a person having ordinary skill in the art to which" the invention pertains. I was also asked to draw upon those factual assessments and consider whether or not claims 1-9, 12-19, and 22-44 actually would have been obvious at the time of the invention to people having ordinary skill in the art.

Finally, I was asked to assess the particular assumptions and rationales on which the United States Patent & Trademark Office ("USPTO") relied when rejecting claims 1-9, 12-19, and 22-44 on the ground that the inventions detailed in those claims would have been obvious based on U.S. Patent No. 5,325,765 to Sylvan and Dragone ("Sylvan") in view of U.S. Patent Application Publication No. 2002/0185010 by Spiteri ("Spiteri") and in certain cases in further view of either U.S. Patent No. 3,389,650 to Michielsen ("Michielsen") or U.S. Patent No. 3,971,305 to Daswick ("Daswick").

Exhibit A lists the materials that I considered in the course of conducting my analysis.

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[1] I understand from counsel that the '925 invention was made at least as early as September 10, 2003, when the '925 application was filed. I have used that date for purposes of my analysis. If an earlier invention date is proven, however, it would not materially impact my analysis.

I expect to provide testimony at trial conveying and explaining the opinions set forth in this report. I further expect to provide testimony covering additional background information pertinent to this case. My testimony may include use of exhibits and demonstrations. I have not yet prepared such exhibits or demonstrations, but expect to do so in accordance with the Court's scheduling orders. In support of my opinions, I may also use any of the documents produced by the parties in discovery and/or industry publications, and particularly those documents referred to in the body of this report or in any exhibit hereto. If additional documents come to light at a later time, I reserve the right to address those as well.

My compensation in this case, which follows my standard fee schedule and is not contingent in any way on the outcome of this litigation, is as follows: $100 per hour for trial preparation activities; $400 per hour for deposition testimony; $2,000 for a half-day of trial testimony; and $3,000 for a full day of trial testimony.

II. QUALIFICATIONS

I am the Executive Director of the Coffee Quality Institute ("CQI"), a non-profit organization that the Specialty Coffee Association of America ("SCAA") founded in 1996 in order to improve the quality of coffee and also the lives of the people who produce it. I became Executive Director of CQI in 2006.

I previously served for 15 years as the Executive Director of the SCAA, an organization that I co-founded with other industry members in 1983. The SCAA is the trade association for the specialty coffee industry and is involved in setting quality standards and providing industry training in the areas of coffee processing, roasting, cupping and brewing. During my tenure as Executive Director, the SCAA grew in size from 350 to over 2,400 members. The SCAA also established a number of technical standards that advance quality guidelines in all facets of coffee, from seed to cup. I remain on the organization's staff as Senior Advisor on technical specifications for coffee quality.

I also worked as vice president of marketing for Lingle Bros. Coffee, Inc. for 20 years from 1970 to 1990. During this period I directed the company's sales programs for the food service, office coffee service, and specialty coffee market segments. I was responsible for establishing quality standards for the company's products and conducting training programs for both company personnel and customers. In addition, I represented the company on various coffee industry boards and committees.

I graduated from the United States Military Academy with a B.S. in civil engineering.

I have served on committees of the National Coffee Association and the National Coffee Service Association. I was also Chairman and a member of the Board of Directors of the Coffee Development Group/Promotion Fund of the International Coffee Organization.

I have received a number of coffee industry honors. In 1998, I was awarded the National Medal of Merit by the Federation of Coffee Growers of Colombia. In 2004, I was awarded the Order Flor de Café Medal of Merit by the Guatemalan National Coffee Association. In 2007, I

was awarded the Bwana Kahawa Lifetime Achievement Award by the Eastern African Fine Coffees Association (EAFCA). EAFCA officers dubbed me the "grandfather of the specialty coffee movement."

I have testified before the U.S. House Committee on International Relations Subcommittee on the Western Hemisphere at hearings concerning "The Coffee Crisis in the Western Hemisphere."

Through my three decades of practical work experience in the coffee industry, I have become intimately familiar with the process of brewing coffee and the many variables that contribute to the quality of the product in the drinker's cup. I pioneered the use of the Coffee Conductivity Meter, an electronic instrument used to measure coffee strength. I also have extensive experience "cupping" coffee (i.e., evaluating the sensory effects of coffee's aroma, taste, and body). I travel extensively internationally teaching these skills in many coffee-producing countries.

I have written a number of books related to the coffee industry. For example, I wrote The Coffee Cupper's Handbook, which is now in its fourth edition. Coffee cupping is the traditional means for professional coffee tasters to make sensory evaluations of coffee beans. I wrote the Cupper's Handbook in order to promote the discussion of meaningful and accurate coffee flavor terminology. The book describes flavor chemistry and explains the sources of coffee's aroma, taste, and body.

Likewise, The Coffee Brewing Handbook: A Systematic Guide to Coffee Preparation is a compendium of the many scientific studies on coffee brewing conducted by the coffee industry during the last fifty years. I wrote the Brewing Handbook to help coffee merchants understand how to maximize the potential of the coffee beans that they purchase. The first edition was published in 1996. A second edition is forthcoming. In my report, I refer to the first edition simply as "my 1996 Coffee Brewing Handbook."

I have also written shorter books (The Basics of Cupping Coffee and The Basics of Brewing Coffee) in order to distil the content of my handbooks for a broader audience.

Exhibit B lists various books and articles that I have written, particularly over the last ten years. I regularly write for CQI and SCAA circulars as well as other trade publications.

A list of the cases during the last four years in which I have testified as an expert either at trial or by deposition is provided in Exhibit C.

III. SUMMARY OF OPINIONS

After studying claims 1-9, 12-19, and 22-44 of the '925 application in light of both (1) my own knowledge about the process of brewing coffee and the nature of the coffee industry and (2) my review of materials identified by the USPTO or otherwise provided to me in the course of the litigation, I conclude the following:

- The '925 inventors solved a problem that had long bedeviled the coffee industry: how to provide a single cup of freshly brewed coffee "on demand" while making it strong enough while still properly balanced to satisfy typical coffee-drinking consumers. As I discuss on page 14 of my 1996 Coffee Brewing Handbook, this requires that (1) the "total dissolved solids" (TDS) in the coffee measure between 1150-1350 ppm and (2) between 18-22% of total soluble materials actually be extracted.

- The '925 invention's novel concept of using a "fluted filter" inside an enclosed brewing cartridge went against then-conventional wisdom in the industry. Fluted filters themselves had been known for decades, yet no one previously had even tried to adapt them for use in systems that could brew under pressure (i.e., as opposed to relying on gravity). The '925 inventors nevertheless went down this new path, notwithstanding that it required disregarding long-running industry concerns about phenomena like the rapid "channeling" of water through the coffee bed.

- For these and other related reasons, I conclude that the beverage-filter cartridge designs recited in '925 claims 1-9, 12-19, and 22-44 would not have been obvious to a person of ordinary skill in the art as of September 2003.

- I fundamentally disagree with the USPTO's core rationale for finding the '925 claims obvious: the idea that one of ordinary skill in the art as of 2003 would have combined Sylvan (illustrating an enclosed beverage cartridge that uses a smooth filter directly connected to the side walls of the cartridge) with Spiteri (describing a fluted filter for use with conventional coffee makers) because one would have wanted to increase the effective filtering area and thereby improve Sylvan's flow rate. There are multiple reasons why this is illogical:

    - First, there was no reason at all to modify the cartridges illustrated in Sylvan in the hope of brewing coffee even more quickly than was possible using Sylvan's cartridges themselves. In fact, people skilled in the art of coffee brewing have long understood that simply increasing flow rate while holding other inputs constant is a recipe for weaker coffee.

    - Increasing the flow rate would have been a particularly bad idea with the technology disclosed in Sylvan, which as of 2003 was being publicly sold in the form of Keurig's "conical-filter" K-Cup portion packs. I personally evaluated these cartridges and know that they brewed coffee very quickly. In fact, this was well known in the industry. The problem was that the coffee itself was quite weak. Under those circumstances, increasing flow rate would have been going in exactly the wrong direction.

    - In fact, people in the coffee industry as of 2003 would not have even considered the pressurized Sylvan system to be a "conventional coffee brewer means" (as specified in Spiteri).

IV. BACKGROUND

A. Coffee Brewing Basics

Brewing coffee involves combining hot water with roasted and ground coffee. A solution is formed when the water penetrates the coffee grounds and dissolves some of the chemical components that it encounters therein. Certain compounds dissolve rapidly when they come into contact with the water, while others dissolve more slowly. Coffee gets most of its flavor from the many chemical compounds released when ground coffee particles are placed in contact with hot water.

Proper brewing technique is a critical step in the process of obtaining a desirable cup of coffee. If the brewing parameters (detailed below) are not properly controlled, one could start with the highest-quality coffee beans in the world and nevertheless find oneself with drink that is not fit for human consumption.

The nature of the finished coffee depends on strength (i.e., solubles concentration) as well as extraction (i.e., solubles yield). Each must fall within a relatively narrow range in order for the coffee to be acceptable to consumers.

1. Coffee Strength

Strength is a measure of the concentration of soluble compounds. While individual tastes vary, the most acceptable ranges of concentration normally fall between 1.0% and 1.5% coffee compounds and between 99.0% and 98.5% water. The absolute weakest drink palatable to the average person is about 0.5% coffee compounds and 99.5% water, and such a drink would draw many complaints. For the average person, solubles concentrations between 1.15% and 1.35% tend to offer the most enjoyable level of intensity. Concentrations below 1.15% typically are insufficient to present all of the flavor components at levels sufficient for typical consumers to sense. Conversely, concentrations above 1.35% tend to present flavors at too intense a level to be easily perceived. (The Coffee Brewing Handbook, p. 14).

Solubles concentrations (and thus coffee strength) is typically expressed in terms of total dissolved solids ("TDS") – an objective measurement detailed in Section IV.B below. For example, a TDS reading of 1180 corresponds to a solubles concentration of 1.18% coffee flavoring material.

2. Coffee Extraction

Extraction is a measure of solubles yield – the percentage of the coffee flavoring material in the beverage as compared to the total amount of coffee grounds used to prepare the beverage.

Around 28% of the matter in coffee beans will dissolve in hot water relatively easily. The remaining material is primarily cellulose bean fiber and is not water soluble under normal brewing conditions.

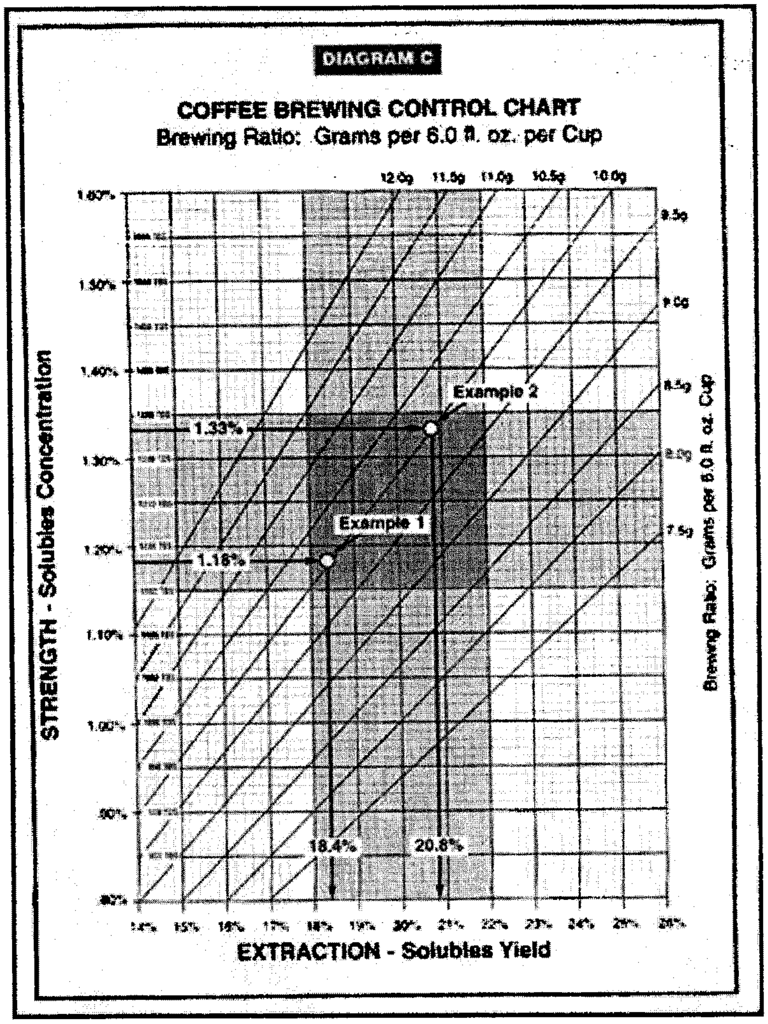
This does not mean that it is desirable to have 28% extraction. On the contrary, yields above approximately 24% result in over-extracted coffee with bitter, astringent flavors. By the same token, yields under around 16% result in under-developed drinks with grassy and/or peanut-like flavors. The best flavors are obtained when the extraction is between 18% and 22%.

As described in Section IV.B below, extraction percentages can be calculated if one knows (1) the solubles concentration and (2) the ratio of coffee to water used for the brew.

B. Objective Measurements of Coffee Quality

Historically, it proved difficult to measure objectively the quality of brewed coffee. In the late 1950s, the Coffee Brewing Institute studied this problem and developed a way to measure the amount of dissolved flavoring material present in the coffee and then also determine the solubles yield based on the specific coffee-to-water ratio used to produce the brew.

For example, a given brew might have a solubles concentration of 1.33%. If 10 grams of ground coffee and 6 fluid ounces of water were used to prepare that serving, 2.08 grams of material would have been removed from the grounds (20.8% extraction). These calculations can be performed with the aid of a diagram like the coffee brewing control chart that I included in The Coffee Brewing Handbook:



When the Coffee Brewing Institute was first studying these issues in the 1950s, there was no easy way to measure solubles concentration. The standard "oven-dehydration" method was quite laborious.

In 1975, however, I pioneered the development of an electronic instrument – called the coffee conductivity meter – for measuring solubles concentrations. In the process of designing the conductivity meter, I conducted extensive studies to collect data relating conductivity to brew strength and beverage temperature. This information was necessary to calibrate the meter and thus ensure accurate results.

Today, the coffee conductivity meter is by far the most common approach in the industry for measuring TDS levels and thus by extension calculating extraction percentages.

C. The Brewing Process in Detail: The 24 Variables of Coffee Brewing

The brewing process as a whole proceeds in three distinct stages: (1) wetting, (2) extraction, and (3) hydrolysis. In the initial wetting stage, the coffee bean fiber absorbs hot water, thereby driving gas from the coffee particles and the small interstitial spaces inside the particles. This sets the stage for extraction, in which the water-soluble flavoring compounds dissolve – moving out of the bean fibers and entering the water. Finally, hydrolysis involves larger carbohydrates, which themselves are normally insoluble in water, breaking down into smaller compounds that do dissolve.

The quality of the finished product depends on the interaction of numerous different variables. I detail 24 distinct factors in my Coffee Brewing Handbook text as follows:

Coffee Product	
Blend Components:	1. Ratio of blend components
	2. Bulk density of beans
	3. Chemical composition of beans
Roast Development:	4. Methodology of roasting
	5. Rate of roasting
	6. Degree of roast
	7. Rate of degassing
Grind:	8. Average size of particles
	9. Size distribution of particles
	10. Particle shape
Brewing Equipment	
Time of Brewing:	11. Time of water contact
Temperature:	12. Contact temperature
	13. Temperature gradient during brewing
Turbulence:	14. Complete wetting
	15. Uniform flow
	16. Particle movement
Filtering Method:	17. Method of separation
	18. Degree of clarification
Holding Conditions:	19. Length of time and method of holding
	20. Holding temperature
Ingredients	
Brewing Formula:	21. Coffee (by weight)
	22. Water (by volume)
Water:	23. Water composition
	24. Water treatment

(p. 24).

Certain of these variables are particularly significant to my analysis in this matter, and I discuss them in the following sections. With that said, attention to all of the variables is necessary in order to brew and serve an acceptable cup of coffee. As such, the USPTO patent examiner's conclusion are fundamentally flawed because he wrongly assumed that the "quality or type of coffee" trumps other variables. (K001068). This is a common misunderstanding of people who are not involved in the coffee industry and/or not familiar with the coffee brewing process. While using quality beans is necessary in order to achieve a desirable cup of coffee, it is by no means sufficient. As explained above, one could start with the highest-quality coffee beans in the world and nevertheless find oneself with a drink that is not fit for human consumption.

1. Time of Water Contact

The amount of time that the ground coffee remains in contact with the hot water dictates the percentage of solubles yield. As noted above, around 28% of the matter contained in roasted coffee beans will dissolve in water relatively easily. It certainly does not instantly dissolve, however. If the water rapidly "tunnels" through the coffee bed, for example, relatively little of the available solubles will actually be extracted.

While less contact time is typically required when using a fine grind of coffee, there are certain hard limits that apply regardless of other variables. As noted in my 1996 Coffee Brewing Handbook, the correct brewing time when using a fine grind "ranges from 1 to 4 minutes." This holds true "regardless of the equipment used or the quantity being prepared." (pp. 30 and 43).

2. Filter-Related Variables

An appropriate filtering medium is one of the essential elements of any type of coffee brewing. Filters clarify the coffee by separating insoluble material from the brew.

Filter selection can also impact the time of water contact. As I explained in the 1996 Coffee Brewing Handbook, a filter should retard the flow of water so as to allow for a "steeping period." (p. 43). During this time, the coffee flavoring material migrates from the center of the coffee particles to the surface, where it can enter into solution with the water flowing past. This is critical to proper extraction. If the flow rate is too fast, the result is mere "rinsing" of the coffee particles, in which case the water removes flavoring material only on or near the surface. (p. 43). Rinsing results in under-extraction.

My 1996 text explains that different types of filters have different degrees of permeability, and that one should select the filter that will provide the correct flow rate for the particular brewing application of interest. (p. 43). Indeed, the permeability of the material in a filter is typically a much more significant variable than mere surface area even in the case of conventional gravity-based brewing.[2]

[2] Gravity-based brewing was the primary (though certainly not exclusive) focus of my 1996 text.

3. Turbulence-Related Variables

"Turbulence" refers to the mixing action created when the water actually passes through the coffee grounds. It is important to achieve sufficient turbulence to wet the coffee particles and in turn cause the water to flow uniformly through them. As noted above, wetting constitutes the initial step of the brewing process. Uniform flow also facilitates effective extraction – the second step.

Insufficient turbulence often manifests itself in the form of "channeling," whereby water flow is excessive in certain portions of the coffee bed and insufficient in others. As a result, some parts of the coffee bed become over-extracted while others remain under-extracted. This gives coffee drinkers the worst of both worlds: brew that is at once bitter (i.e., corresponding to the over-extracted portions of the bed) and grassy (i.e., corresponding to the under-extracted portions). As I noted in my 1996 book, "[t]his problem becomes readily apparent in equipment using relatively short brewing times, particularly single-cup brewers." (p. 36).

Turbulence as a whole is dictated by three different variables: (1) the wettability of the coffee grounds,[3] (2) the height of the coffee bed, and (3) the feed of the brewing water over the bed. If the coffee bed is not deep enough, it will encourage undesirable channeling because the bed as a whole lacks adequate resistance. In the case of the conventional gravity-fed brewing systems on which my 1996 text focused, the bed should measure from 1 to 2 inches in depth.

4. Brewing Formula

Brewing formula concerns the ratio of coffee (by weight) to water (by volume).

Using too little coffee (or too much water) will result in beverages that have too weak a taste if one balances other variables in the brewing process to provide an extraction in the desired 18% to 22% range. If one instead balances the other variables as necessary to achieve a strength within the desired TDS range, the coffee will be over-extracted and have a bitter flavor.

Conversely, using too much coffee (or too little water) will result in beverages that are too strong if one achieves an extraction in the desired 18% to 22% range. While one could reduce the strength to something more desirable, the inevitable consequence would be coffee with underdeveloped flavor.

These considerations can be visualized using the Coffee Brewing Control Chart:

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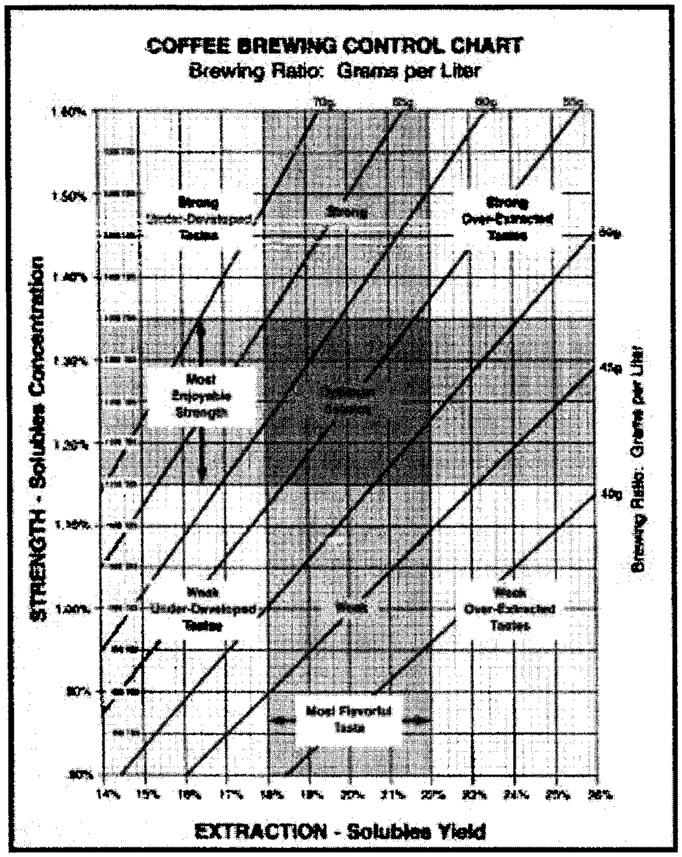
[3] Wettability varies among different coffee particles and is the result of a variety of factors. It is not directly relevant to my analysis in this matter.



With single cup brewers, the traditional rule of thumb was to use 9.0 to 11 grams of coffee per 6 fluid ounces of water. (Coffee Brewing Handbook, p. 15). Translated into the larger serving sizes that have become expected in today's culture, this means 12.0 to 14.7 grams of coffee for an optimal 8 ounce drink and 15.0 to 18.3 grams for 10 ounces.

D. Brewing Methods

My 1996 Coffee Brewing Handbook detailed six basic methods for brewing coffee: steeping, decoction, percolation, drip filtration, vacuum filtration, and pressurized infusion. (p. 4).

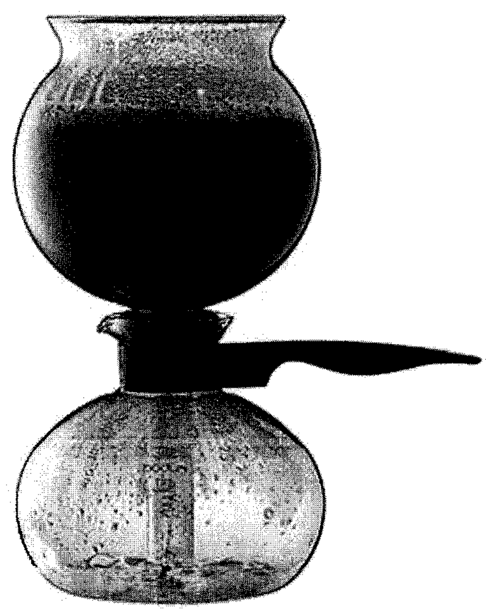
1. Steeping

Steeping entails mixing coffee grounds with hot water and leaving them in contact with the water for a specified amount of time, after which the grounds are separated. This is commonly achieved using a device called a "plunger pot" or "French Press:"

While popular among many coffee connoisseurs, the French Press is not a realistic option for the typical customer who wants a convenient cup of coffee in the morning or while on a break at work. It also produces coffee with sediment at the bottom of the cup.

2. Vacuum Filtration

Vacuum filtration is a variation of the steeping method. It uses a two-chamber device that typically consists of glass globes. The globes fit tightly together, with some sort of filter between them. The ground coffee goes in the upper container, and water is heated in the lower one. Steam from the lower container forces hot water up through the filtering unit and into the coffee. Once the heat source is removed, steam condenses in the lower chamber to form a vacuum, which draws the brewed coffee down through the filter and into the lower chamber.



Vacuum filtration can produce a quality cup of coffee and certainly makes for a dramatic visual display. As with using a French Press, however, vacuum filtration is not a practical option for the typical coffee drinker who desires a quality beverage without significant effort.

3. Decoction

Decoction involves mixing loose coffee grounds with boiling water that continues to boil for an arbitrary amount of time. "Turkish-style" preparation is an example of decoction-based brewing.

Decoction typically leads to complete extraction given the high temperature of the boiling water as well as the extreme turbulence that results from the boiling itself. As discussed above, complete extraction is undesirable because it leads to bitterness. Not surprisingly, Turkish-style coffee is normally prepared by first stirring finely pulverized coffee together with sugar. While this has niche appeal, it is not what Americans typically desire when seeking a cup of coffee.

4. Percolation

Percolators use a pump to recycle hot water through the ground coffee again and again until it has reached adequate strength. Much as with decoction, this typically results in an undesirable over-extracted drink.

Percolators today are museum pieces. They quickly fell out of favor in the 1970s, after automatic drip machines (discussed below) and inexpensive paper filters hit the market.

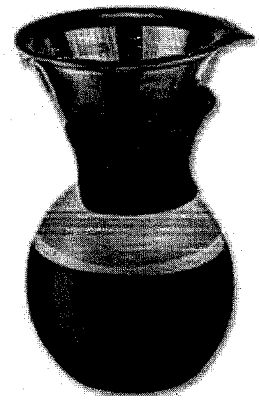
5. Drip Filtration

Unlike percolation, drip filtration involves passing hot water through the ground coffee only a single time. The extract drips from the brewing chamber into the coffee pot or other receptacle. With drip filtration, therefore, under-extraction is often a bigger worry than over-extraction. If the hot water passes through the ground coffee too quickly and/or too smoothly (i.e., without adequate turbulence), one could start with the best beans in the world and wind up with a drink that would fall short of consumers' expectations and which many people would not even consider to be coffee at all.

Drip filtration may be achieved using a variety of techniques.

a. Manual Drip

One approach is to put a filter and filter holder over a carafe or other receptacle, then add the coffee to the filter and pour hot water over the coffee bed manually.

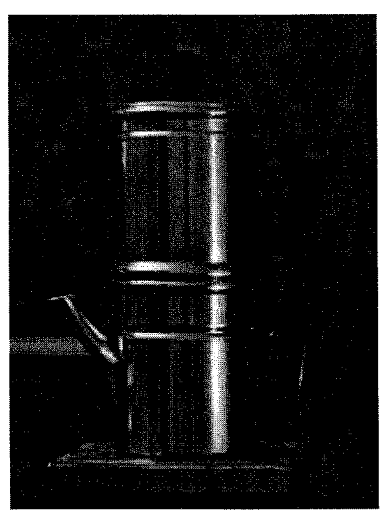


This "manual drip" method allows for total control. Experienced users can select the proper water temperature and coffee-to-water ratio, then pour the water over the coffee bed in a way that ensures optimal saturation. Much as with the French Press and vacuum-filtration equipment, however, manual-drip brewing is not a realistic option for ordinary coffee drinkers who want a quality cup without a lot of effort.

b. <u>Drip Pots</u>

Stovetop-based pots offer a somewhat easier option for drip filtration. There are a variety of different variations on the basic idea of heating the water and then in the same device allowing it to flow through the coffee bed.

One example is the "reversible" drip pot – also known by names like the "macchinetta" or "Neapolitan Flip Pot." It has three different chambers. The bottom section is filled with water. The middle section has a filter and is filled with coffee. An upside-down chamber is placed on top. The entire contraption goes on the stove, which heats the water. The device is then removed from the stove and flipped over, after which water passes through the coffee and filter into the now right-side-up serving pot.



Drip pots were a superior alternative to percolators, but proved unable to compete with automatic drip machines in most contexts.

c. <u>Automatic Drip Machine</u>

Automatic drip machines allow users to brew a pot of coffee by simply putting the appropriate amount of ground coffee in a filter inside the brew basket and then pushing a button. The machine does everything else. It heats water and then uses a spray head to distribute the liquid onto the coffee bed. The brewed coffee passes through the filter and drips down into the pot or carafe.

Automatic drip machines such as those sold by Mr. Coffee® became available in the United States starting in the early 1970s and quickly outpaced percolators in popularity. For many years, in fact, automatic drip machines were the first – and often only – thing that many people associated with the generic phrase "coffeemaker," notwithstanding that there were various alternatives such as plunger pots, vacuum-filtration equipment, percolators, manual-drip assemblies, and drip pots.

While convenient for certain applications, automatic drip machines have significant limitations that make them impractical in various other contexts. When using a conventional machine to brew 8-10 cups of coffee, for example, the brewing process takes longer than many people want to wait. Within minutes after brewing, moreover, the flavors in coffee begin to degrade rapidly.[4] (<u>The Coffee Brewing Handbook</u>, p. 51).

Certain automatic drip machines are designed to brew smaller quantities of coffee, but the process still requires at least a few minutes from the moment when one first desires the beverage to the time when it is available. Even when using disposable paper filters, moreover, it is still necessary to clean the brew basket in between uses so as to ensure proper brewing. This is particularly true when different people are sharing the same machine while each using different types of coffee.

Furthermore, automatic drip machines in general and smaller units in particular frequently suffer from a wide variety of design flaws. The experience with small-capacity units is particularly telling, as it confirms that one cannot simply "miniaturize" a brewing system and expect to get comparable results.

6. <u>Pressurized Infusion</u>

Pressurized infusion involves forcing highly pressurized water through coffee grounds that have been compacted into a small cake. The force extracts the soluble flavoring materials (as in other brewing methods), but also emulsifies insoluble oils and suspends bean fiber particles and gas bubbles. The result is espresso, with its distinctive syrupy consistency.

[4] This is particularly true when using a "burner" or some other form of direct heat to keep the coffee hot.

V. OPINIONS AND EXPLANATIONS

Based on my review of the materials listed in Exhibit A, I understand that the USPTO declined to issue a patent for claims 1-9, 12-19, and 22-44 of the '925 application on the ground that those claims would have been "obvious" to a person of ordinary skill in the art based on certain "prior art" references that were allegedly available as of the '925 application's September 10, 2003 filing date. Specifically, I understand that the USPTO rejected claims 1-4, 7, 12-14, 17, and 22-44 on the theory that they would have been obvious over the combination of the Sylvan patent and the Spiteri published patent application. I also understand that the USPTO rejected the other claims based on the combination of Sylvan and Spiteri with an additional prior art reference – Daswick in some cases and Michielsen in others.

Based on my review of the correspondence between the USPTO and Keurig, I understand that the USPTO justified its combination of Sylvan and Spiteri on the theory that a person of ordinary skill in the art would have desired to substitute Spiteri's fluted filter in place of the ordinary filter disclosed in Sylvan. I further understand that this rationale is an essential foundation for rejections based on Daswick and Michielsen as well.

Based on my own assessment of (1) the scope and content of the prior art, (2) the level of ordinary skill in the art, and (3) the differences between the prior art and the pending '925 application claims, I disagree with the USPTO and conclude that it would not have been obvious to a person skilled in the art as of 2003 to make a beverage-filter cartridge covered by any of claims 1-9, 12-19, and 22-44 of the '925 application. Section V.A. below details my analysis.

In particular, I believe that the USPTO's analysis is fundamentally flawed and turned on a series of erroneous factual assumptions. Section V.B details these errors.

A. <u>*Graham* Factor Analysis</u>

Although I am not a lawyer, I understand from Keurig's counsel that any obviousness rejection must be based on an assessment of the following: (1) the scope and content of the prior art, (2) the differences between the prior art and the claimed invention, (3) the level of ordinary skill in the art, and (4) various "objective" indicia such as whether there was a long-felt need for the claimed invention. Counsel therefore asked me to assess each of these factual considerations, which I understand are known as the <u>Graham</u> factors.

1. Scope and Content of the Prior Art

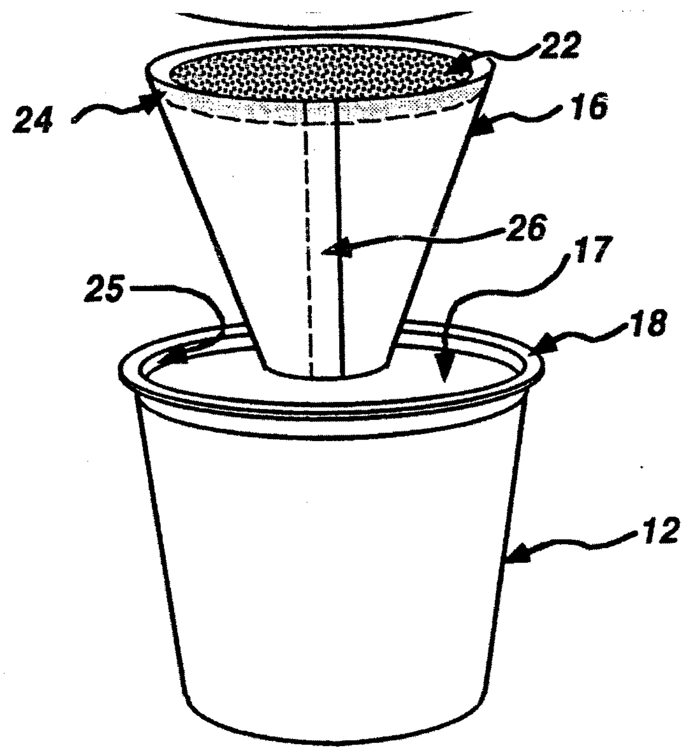
The first factor that I was asked to consider concerns the scope and content of the prior art. Based on my review of the communications between Keurig and the USPTO, I understand that the USPTO has rejected claims 1-9, 12-19, and 22-44 of the '925 application based on Sylvan, Spiteri, Daswick, and Michielsen. I discuss each below.[5]

a. Sylvan

Sylvan describes a beverage filter cartridge for use in an unusual brewing process that does not fit squarely into any of the conventional brewing techniques that I detailed in my 1996 Coffee Brewing Handbook. See Section IV.D above. Sylvan's cartridge is designed to brew a single cup of coffee or tea (see, e.g., Col. 1, lines 13-15) using "pressurized hot water" (Col. 4, lines 4, lines 22-23). Sylvan's design certainly does not constitute the sort of "pressurized infusion" system that I referenced in my text, however. For example, there is no discussion of packing the ground coffee down into a compacted bed.

Sylvan emphasizes the need to avoid having the filter collapse against the sides of the cartridge during the brewing process. (Col. 1, lines 50-53). In particular, Sylvan warns that such collapse can lead to low flow rates even when the water is injected under pressure. (Col. 1, lines 34-38). To this end, Sylvan discloses a plastic cartridge with a "self-supporting" filter that is sealed to the sides (i.e., the "opening of the base"). (Col. 2, lines 8-13). Sylvan also teaches picking a filter design that has "a form different and smaller than the predetermined shape of the base so that the filter element diverges from the base." (Col. 2, lines 13-15). In other words, Sylvan suggests that after one has designed the plastic exterior of the cartridge (i.e., the "predetermined shape of the base"), the filter inside should be designed with a different geometry that allows for significant space between the sides of the filter and the sides of the cartridge. This design reflects Sylvan's above-noted emphasis on avoiding contact between the filter and the cartridge walls. In the particular embodiment that Sylvan illustrates, the base is a cylinder with sides almost at right angles to the ground, whereas the filter has a pronounced conical shape:

[5] I understand that the USPTO had previously cited additional references, including U.S. Patent No. 6,007,853 to Lesser, U.S. Patent No. 6,645,537 to Sweeney, U.S. Patent No. 6,602,410 to Tanner, and PCT publication WO91/14389 by Frise. My review of the communications between Keurig and the USPTO indicates that the USPTO later abandoned those theories. Accordingly, I have not at this time analyzed those references in detail. Based on a brief review, however, they do not appear to add anything beyond that in Sylvan, Spiteri, Daswick, and Michielsen. None even suggests the possibility of using a filter with pleats, flutes, and/or corrugations when brewing coffee using a pressurized system. Nor do any suggest that it would have been desirable to achieve a flow rate in a Sylvan-type system faster than the flow rate that one would observe with a filter constructed along the lines illustrated in Sylvan itself.



(Col. 1, lines 50-53).

Furthermore, every single filter illustrated or otherwise suggested in Sylvan is smooth – without any sort of flutes, pleats, or corrugations.

b. Spiteri

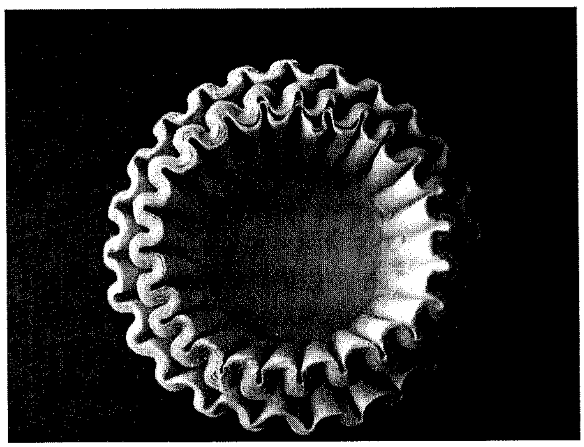
Spiteri discloses a "self supporting coffee filter" for use in a "conventional coffee brewer means such as an electric drip brewer." (Paragraph 21). Specifically, Spiteri concerns a specific type of "fluted" filter designed to avoid a problem that I had noted in my own 1996 Coffee Brewing Handbook. As I wrote, "[i]f the paper's fluting and shape don't hold up during brewing, the filter will fall away from the sides of the brew basket and possibly cause the water to bypass the coffee bed." (p. 44). This would dilute the brewed coffee with water that has not had any contact with the soluble material at all. Separation between the filter and the side of the brew basket could also allow unfiltered coffee to bypass the filter and flow directly into the coffee pot. In the words of Spiteri itself:

> An object of the present invention, is to provide a means to prevent a filter from collapsing in its receptacle and allowing unwanted product to pass through unfiltered to the user's cup.
>
> Another object of the present invention is to provide a number pleats [sic] to the paper filter sized and shaped to self support the wet walls in its desired upright position, to prevent the filter from collapsing thus water bypassing the infusion grounds weakening the brewed product.

(Paragraphs 2 and 3).

In other words, Spiteri disclosed a particular kind of fluted filter design in the hope of improving filter rigidity and thereby reducing the risk of separation between the filter and the brew basket. Fluted filters themselves had been around long before the Spiteri publication or even my 1996 text.[6] As with all of those other fluted filters, Spiteri's model was designed to be "stood on the inside of a vessel such as a coffee basket." (Paragraph 5).

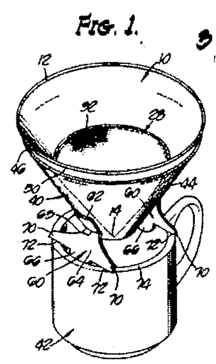
Spiteri's particular fluted design also purportedly allowed for a filter that could be packaged flat so as to facilitate easier storage and handling. (Paragraph 6). By contrast, typical fluted filters must be packaged in "nests" with substantial empty space in the middle:



The only type of filter that Spiteri actually discloses has a particular "fan-shaped" configuration.

c. **<u>Daswick</u>**

Daswick describes a disposable apparatus for making a single cup of coffee by means of a slight variation on the conventional manual, gravity-based drip brewing as described in Section IV.D.5.a above:



[6] One example is the Frise publication mentioned above.

Specifically, Daswick requires that hot water be manually poured into the filter, which is designed to prevent the water from passing directly over the coffee grounds. (Col. 3, lines 18-23). Daswick's design is intended to allow for a slower brewing process with better turbulence, thereby avoiding tunneling processes. See, e.g., Col. 3, lines 23-28 (warning that "direct pouring of hot water upon the coffee grounds tends to extract the bitter acids from the grounds and also may tend to pack the coffee grounds into the bottom of the filter in such a manner to cause inefficient brewing").

Daswick surveys a number of earlier inventions for brewing single servings of coffee. (Col. 1, lines 20-40). To the best of my knowledge, however, neither these earlier inventions nor Daswick itself achieved any measure of commercial success. Sylvan itself notes many of the disadvantages of this sort of design, including the lack of automation. (Sylvan Col. 1, lines 21-23). As discussed above, this is a serious impediment when trying to target typical consumers who desire a quality cup of coffee without significant attention or effort. For this reason, manual-drip equipment like that discussed in Daswick has never gained a significant foothold in the marketplace.

d. Michielsen

Michielsen also describes filters for use in conventional drip brewing:

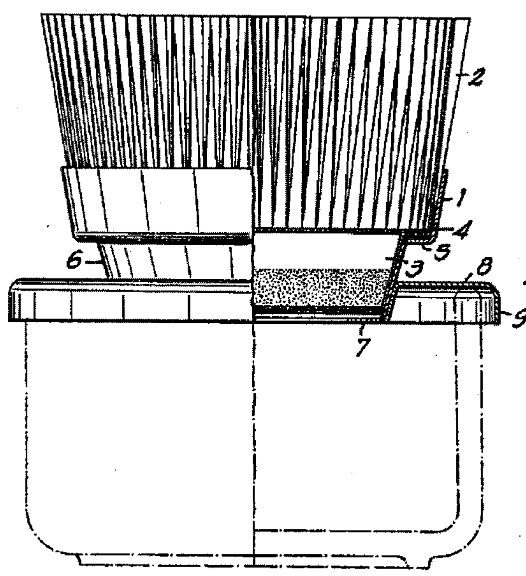


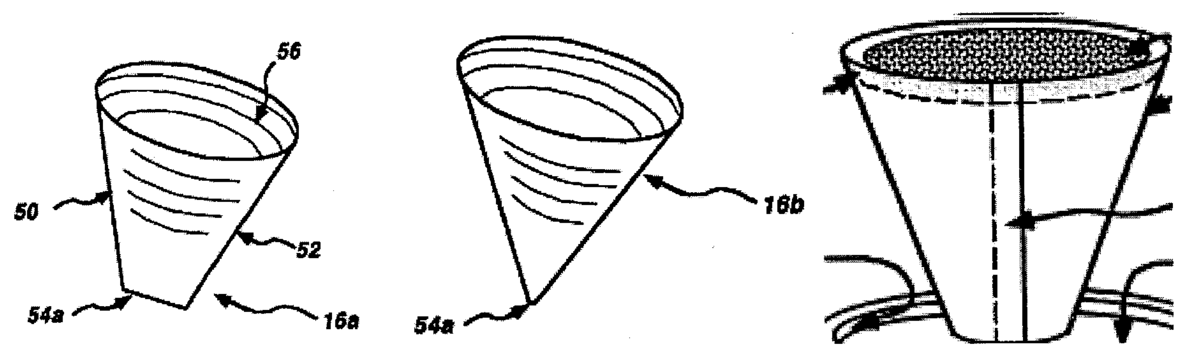
Fig.1

It addresses the same problem discussed in Spiteri: how to make a paper filter that stays in good contact with the brew basket or other apparatus during the brew process. Michielsen repeatedly stresses this goal of holding the filter "against the wall" of the brew vessel. (Col. 1, lines 59-61). To this end, Michielsen suggests using a brew vessel that has pleated walls. (E.g., Col. 2, line 27). The ultimate goal is the same as that discussed in Spiteri: ensuring that the hot water is "forced to pass through" the filter in which the coffee sits. (Col. 4, line 38).

2. Differences Between the Claimed Invention and the Prior Art

I understand that the second Graham factor concerns the differences between the claimed invention and the prior art. The bigger the difference, the less likely it is that the claimed invention would have been obvious. Here, there are a number of major differences.

First, there is a fundamental distinction between the prior art and all of the pending '925 application claims. The claims require an enclosed cartridge (i.e., having a bottom, sides, and a lid) that is divided into two chambers by a filter that itself is directly joined to the cartridge walls. The first chamber contains the beverage medium (e.g., ground coffee), and the filter in turn has "pleats," "flutes," or "corrugations." Many of the claims further specify that these pleats, flutes, or corrugations create "exit channels," thereby facilitating access to the second chamber. By contrast, Sylvan – the one piece of prior art on which the USPTO relied to suggest an enclosed cartridge subdivided into two chambers by a filter element that is directly attached or joined to the sides of the cartridge itself – says nothing whatsoever about flutes, pleats, or corrugations. Sylvan instead describes and illustrates a series of smooth-walled filters:



The complete absence of anything in Sylvan concerning fluted, pleated, or corrugated filters is striking given that fluted filters themselves had been known in the coffee industry long before 1992, when I understand that the disclosure in Sylvan was written. Had the Sylvan patent inventors believed that a fluted filter was appropriate for their invention, they easily could have illustrated it or simply made reference to any of the numerous fluted filters available in the marketplace. Instead, the Sylvan patent describes and illustrates only smooth, conical-style filters.

Furthermore, Sylvan discloses a specialized pressure-based brewing process in which the filter is sealed to the sides of the cartridge itself. This unusual approach was not one of the standard brewing techniques that I described in my 1996 Coffee Brewing Handbook.

By contrast, Spiteri describes filters for use in a "conventional coffee brewer" such as an automatic drip machine. (Paragraph 21; see also Abstract). As with then-existing filters for such brewers, Spiteri's filter was designed to stand on the brew basket or other vessel. (Paragraph 5).

Spiteri suggested adding a particular array of flutes or pleats to prevent the filter from "sagging and drooping," as such collapse risked allowing (1) water and/or (2) unfiltered coffee to bypass the filter. (Paragraphs 2-3 and 8). Michielsen addressed the same concerns. (Col. 3, line 38).

In the context of Sylvan's own unique niche, however, the problem addressed by Spiteri and Michielsen did not even exist. By sealing the filter to the sidewalls of the cartridge, Sylvan minimized the risk of either (1) pure water or (2) unfiltered coffee passing into the cup. The filter itself defined an enclosed first chamber containing the coffee. Unless the seal itself failed, water would always need to pass through the coffee (contained within a first chamber of the cartridge defined by the filter itself) and then the filter. This solution was perfect for Sylvan's vision of a disposable, one-time use cartridge.[7]

There is an additional major difference between the prior art and '925 claim 1 along with claims 2-11 and 36-43, all of which "depend" from claim 1. All of these claims require that pleats or flutes in the filter "form exit channels" that lead to the second chamber. Yet none of the art relied upon by the USPTO examiner in rejecting these claims (nor any other earlier materials that I have seen, for that matter) says anything about the possibility of incorporating channels into a pressurized system such as Sylvan's. In fact, the very idea of creating specialized channels for the flow of liquid during the brewing process would have been counterintuitive to a person of ordinary skill in the art as of 2003. As detailed in Section IV.C above, "channeling" of water flow can result in particularly poor coffee that is over-extracted in certain sections and under-extracted in others. As I noted in the 1996 Coffee Brewing Handbook, moreover, this is an especially serious concern when dealing with "equipment using relatively short brewing times, particularly single-cup brewers." (p. 36). Yet Sylvan emphasizes exactly that: an invention for making a single cup of beverage (see Col. 1, lines 13-15) using a cartridge that "is small and compact yet has a high flow rate" (Col. 1, lines 43-45). Accordingly, a person of ordinary skill in 2003 would have avoided modifying the filters illustrated in Sylvan to incorporate exit channels.

There is also a separate key distinction between the prior art and '925 claims 12 and 44 along with dependent claims 13-35. All of these claims require a filter that is corrugated, yet also be configured such that at least a portion of the side "is spaced inwardly from and out of contact with" the outer walls. This is directly contrary to the emphasis of prior art references that teach corrugated filters. For example, Spiteri's pleats are designed to stiffen the sidewalls and prevent either water or coffee grounds from bypassing the filter. Michielsen likewise teaches a filter that "can be held...against the wall" of the brewing vessel. (Col. 1, lines 60-61). In other words, the prior art pointed in exactly the opposite direction of claims 12-35 and 44; it confirms the non-obviousness of those claims.

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[7] It would be completely impractical for a conventional drip system, however. A filter permanently attached to the brew basket would be prohibitively difficult to clean. Nor would it be realistic to buy numerous brew baskets with attached filters and then dispose of them after use. This would be extraordinarily expensive and also require tremendous storage space.

3. Level of Ordinary Skill in the Art

I understand that the third Graham factor concerns the level of ordinary skill in the art. The lower the level of ordinary skill, the less likely it is that a given invention in the field would have been obvious.

My opinion is that the level of ordinary skill in the art as of 2003 was relatively low. Historically, people in the industry had been content with existing technology even in cases where it yielded suboptimal results. This is what I meant in 2001 when I was interviewed for an article in the *Tea & Coffee Trade Journal*:

> When asked why there has not been more progress in the coffee industry during the age that took us from horse drawn carriages to the space shuttle, Lingle quipped that industry members need to be more open to new ideas and keep a more open mind about how they do things.

Timothy J. Castle, Coffee: Then and Now…, Tea & Coffee Trade Journal, Vol. 175/No. 8 (Aug./Sept. 2001).

4. Objective Indicia of Non-Obviousness

Finally, I understand that the final Graham factor encompasses a variety of "objective indicia" such as (1) commercial success achieved by the invention, (2) a long-felt need for the invention, and (3) lack of success by others attempting to satisfy that need. My analysis focuses on the second and third of these considerations.[8]

Long before 2003 (i.e., what I understand to be the invention date for the '925 application), people in the coffee industry had been aware that conventional technologies such as automatic drip brewers were not meeting the desire of many customers for quality coffee "on demand." In the 1990s, companies like Starbucks were drawing people in droves out of the kitchen (whether at home or in the office) and into the coffeehouse to spend more money for a single cup than it would have cost to brew an entire pot of coffee themselves. Many others in the industry desired to tap into these revenue streams, but were unable to do so.

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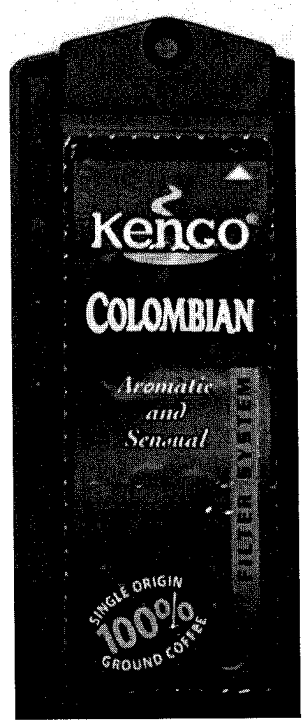
[8] To my understanding, the claimed invention has achieved enormous commercial success as well. In the eight years since the '925 application was filed in 2003, Keurig has gone from having barely any presence in the marketplace at all to selling billions of cartridges a year (K001203) and more coffeemakers than long-established companies like Mr. Coffee (K001541). I understand that the issue of commercial success is being addressed by a separate expert in food and beverage marketing.

As discussed in Section IV.D above, conventional brewing products such as automatic drip machines, manual drip equipment, and plunger pots were not capable of satisfying customers who wanted a quality cup of coffee at the drop of a hat. The conventional products took too long and/or required too much effort.

The "single-serve" technologies existing in 2003 likewise suffered from a different but even more fundamental problem: an inability to brew[9] a satisfactory volume of coffee with a TDS reading of at least 1150 ppm. As noted in my 1996 Coffee Brewing Handbook, coffee is considered "weak" if the concentration of solubles is below this 1150 ppm threshold. (p. 14). Such coffee will draw complaints from many people.

One example is the "Kenco Singles" system, which I understand Kraft Foods had been distributing for a number of years in the British "away from home" marketplace.



I have previously tested a Kenco cartridge, and the TDS value was 1080 ppm. While such coffee may have been competitive in the office setting, it is not a good substitute for the beverages that people could brew at home using automatic drip machines or other conventional equipment.

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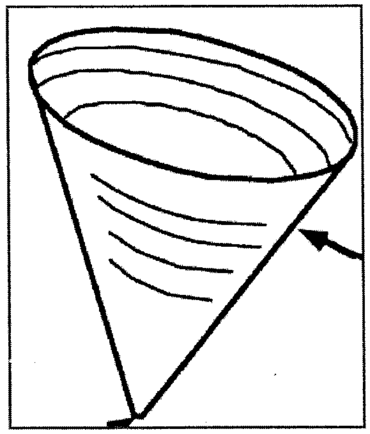
[9] It is important to distinguish freshly brewed coffee from "instant coffee," which is produced by dehydration. The resultant powder is completely soluble in water, such that one can prepare a cup of coffee simply by mixing the instant coffee and hot water. While it is possible to produce very strong beverage this way, the dehydration process interferes with flavor in other respects. Many customers are unwilling even to consider instant coffee.

Indeed, to the best of my knowledge, the Kenco Singles system was never marketed for at-home use.

Keurig itself was another company selling single-serve products for away-from-home use as of 2003. Specifically, I understand that for many years Keurig had been selling cartridges with "conical shaped" filters that closely resembled those illustrated in the Sylvan patent itself:



I understand that sales began in 1998 and continued through 2004, after which the conical-filter design was quickly phased out in place of the fluted-filter design described in the '925 patent itself (filed in September 2003). In fact, I was engaged to evaluate Keurig's product offerings in that time frame as part of my work with the Specialty Coffee Association of America. I thus know from personal experience that the cartridges illustrated in Sylvan yielded weak coffee. As with the Singles system, therefore, it does not surprise me that Keurig's business at the time focused on "away-from-home" placements. The Keurig products that I sampled may have been a reasonable alternative to a communal pot that has been sitting on a burner in the office or car dealership for an hour.[10] Higher quality, however, was necessary in order for Keurig products to displace conventional brewing equipment (e.g., automatic drip machines) in people's homes. As one reviewer reported in December 2003 (shortly after the application for the '925 patent was filed, but well before Keurig first began selling fluted-filter K-Cup portion packs):

> Keurig offers dozens of brands of coffee and teas made in its trademarked K-cup format, but even if you find your favorite, it simply isn't going to taste as robust as if you had ground the beans right before brewing.... <u>***Such a cup might be as good as I could get at the office, but at home, I expect better.***</u>

Joe Yonan, <u>Brew-by-Cup Coffee Makers Fail Taste Test</u>, Boston Globe, Dec. 11, 2003, at H3 (emphasis added).

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[10] Rapid and intense transformations occur in coffee's flavor occur within minutes after it has been brewed. <u>Coffee Brewing Handbook</u>, p. 51. The degradation is even worse if one uses a burner or other direct heat source to keep the coffee hot.

To this end, the '925 inventors solved a challenging problem: how to improve the beverage-filter cartridge described in Sylvan so as to (1) increase the storage capacity available for coffee or other beverage media while (2) preserving the quality of the brewing process itself and (3) also staying true to Sylvan's emphasis on the need for a "small and compact" product. All three of these things were necessary in order to provide customers with a convenient cartridge that was capable of brewing a strong cup of coffee.

The task was much more challenging than simply developing a cartridge capable of holding more coffee. Increasing the footprint of the cartridge as a whole would ignore Sylvan's emphasis on the need for something "small and compact." (Col. 1, lines 44-45).[11] Furthermore, simply increasing the amount of coffee in the cartridge does not necessarily translate into a stronger cup. As discussed in Section IV.C above, proper brewing requires balancing numerous different variables. For example, increasing the ratio of coffee to water is not going to improve the end result if the design change also reduces the evenness of the saturation (e.g., as a result of the "channeling" of water through portions of the bed).

In fact, others had unsuccessfully tried to solve the problem. I have reviewed a series of documents related to testing of Keurig's "M-Cup" cartridge. In many cases, the M-Cup yielded significantly <u>lower</u> TDS values than did conventional conical-filter K-Cup portion packs even though the M-Cup was able to hold larger amounts of coffee. For example:

		Peet's House Blend				Caribou Blend				Decaf Caribou Blend			
		9.0g fill	9.5g fill	10.0g fill	11g fill	9.0g fill	9.5g fill	10.0g fill	11g fill	9.0g fill	9.5g fill	10.0g fill	11g fill
Hand-filled K-Cups	fine grind	821	868	895		845	877	917		873	903	948	
	medium grind	831	848	874		827	885	900		872	880	955	
	coarse grind	753	791	806		831	854	890		834	882	889	

		Peet's House Blend				Caribou Blend				Decaf Caribou Blend			
M-Cups with 0.5"-down filter-to-cup rim weld & 1x25gsm Crompton Superseal distributive insert		9.0g fill	9.5g fill	10.0g fill	11g fill	9.0g fill	9.5g fill	10.0g fill	11g fill	9.0g fill	9.5g fill	10.0g fill	11g fill
	fine grind												
	medium grind				641				753				648
	coarse grind												

	Grn Mtn Dark Magic	Grn Mtn Nantucket Blend	Grn Mtn Our Blend
Prodn K-Cups	894	833	853

(K000120). The TDS values in the 800s and 900s that Keurig was achieving with 9-10 grams of coffee in the regular K-Cup portion pack (as illustrated in Sylvan) were passable for the office environment, albeit not sufficient to compete with the neighborhood Starbucks or the automatic drip machine at home. By contrast, the TDS values in the 600s and 700s that Keurig observed with **<u>11 grams</u>** of coffee in the M-Cup would have been inadequate for any sort of setting.

While I have reviewed other documents that reflect somewhat better results for the M-Cup (e.g., K000255) it does not appear that the cartridge ever achieved acceptable TDS readings to enable Keurig to compete more widely. As the '925 application itself notes:

[11] As a practical matter, moreover, it would have required new brewer designs and prevented the new cartridges from being used in existing machines without extensive retrofitting.

> In an attempt at increasing the TDS of the resulting brew, and as shown in copending commonly owned U.S. patent application Ser. No. 09/782,622, beverage medium storage capacity was increased by lowering the level of attachment of the filter element to a reconfigured outer container wall.[12] Although this did indeed increase the amount of beverage medium available for brewing, it did so at a cost of also increasing the amount of beverage medium receiving less that optimum saturation, with the net affect being an insignificant increase in TDS of the brewed beverage.

(K000619).

Conversely, the invention disclosed in the '925 application itself did succeed in raising TDS levels significantly. I have studied data from tests that Professor Alex Slocum conducted using fluted-filter beverage cartridges that I understand from Professor Slocum to correspond to those claimed in the '925 patent application. (SLOCUM0040). These cartridges brewed reasonable (8 ounce) volumes of coffee with TDS values around 1250 – squarely in the middle of the range (i.e., 1150 to 1350) that tends to offer consumers the most enjoyable level of intensity. (The Coffee Brewing Handbook, p. 14).

Professor Slocum's tests also indicate that the fluted-filter K-Cup portion packs can brew even large (12 oz) servings with TDS values in the range of 830. Such drinks would appeal to at least some people. By contrast, using the 12 oz setting with conical-filter K-Cups yielded TDS values in the range of 650-670. Brew this weak would be unacceptable to almost all coffee drinkers. In fact, I understand that Keurig did not even sell brewers with 12 oz settings until after "Extra Bold" K-Cup portion packs (relying on the fluted filter invention to accommodate more coffee than that possible when using the design illustrated in Sylvan) became available.

5. Overall Assessment

Based on my analysis of the Graham factors discussed above, I conclude that the inventions covered by claims 1-9, 12-19, and 22-44 of the '925 patent application would not have been obvious to a person of ordinary skill at the time of the invention in 2003. The cartridge design specified in these claims departed from the conventions defined in the prior art and instead required that a fluted, pleated, or corrugated filter be directly joined to the cartridge side walls. Such a seal is important for pressurized brew processes such as those emphasized in the Sylvan prior art. Sylvan, however, illustrates only smooth filters. In fact, I am not aware of any attempt at all to use a fluted filter in any sort of pressurized brewing process – let alone the particular one contemplated in Sylvan – prior to the '925 inventors themselves. Yet fluted, pleated, and corrugated filters themselves had long been known in the art.

[12] Keurig documents that I have reviewed specifically link this concept to the "M-Cup." (E.g., K000254).

Indeed, there are several reasons why people of ordinary skill would have avoided combining a fluted, pleated, or corrugated filter (such as those disclosed in Spiteri) with the specialized cartridge design contemplated in Sylvan. As exemplified by Spiteri, fluted filters were contemplated for use with "conventional" brewing systems. Sylvan was anything but conventional, at least as of 2003. Furthermore, Sylvan emphasized the importance of avoiding contact between the filter and the cartridge sidewalls. By contrast, the point of fluted, pleated, and corrugated filters in the conventional context (again, as exemplified by Spiteri) was to promote contact between the filter and a variety of different brew baskets. The '925 inventors pressed ahead despite these teachings, whereas typical designers – historically resistant to new ideas – would have been inclined to follow them.

The non-obviousness of the '925 invention becomes even clearer when one steps back and considers the objective reality of what the inventors actually accomplished. They succeeded where many previously had failed: developing a convenient "single-serve" coffee product that delivered a beverage strong enough to satisfy typical consumers even at home. The problem was much more challenging than simply figuring out how physically to put more coffee in a cartridge while keeping the cartridge itself small and compact. The earlier and unsuccessful "M-Cup" development confirms this. Instead, the '925 inventors had to ensure that their cartridge also did a satisfactory job saturating the larger amounts of coffee that they squeezed into the small and compact footprint. This in turn required considering and balancing the numerous other variables of coffee brewing discussed in Section IV.C above.

B. Erroneous Assumptions on Which the USPTO Relied

Counsel also asked me to apply my Graham factor analysis and assess the particular rationale on which the USPTO relied when concluding that claims 1-9, 12-19, and 22-44 of the '925 patent application would have been obvious. I conclude that the USPTO's analysis is fundamentally flawed for a number of different reasons.

1. The USPTO Incorrectly Assumed that A Person Skilled in the Art Starting with Sylvan Would Desire a Faster Flow Rate than that Possible with Sylvan Itself

The lynchpin of the USPTO's obviousness analysis appears to be the assumption that one would have desired to incorporate folds and pleats (as disclosed in Spiteri) into the ordinary, non-fluted filter illustrated in Sylvan so as to achieve "a higher liquid flow rate as required by Sylvan." (K001105). In other words, the USPTO assumes that people skilled in the art would have read Sylvan as suggesting the need for a faster flow rate than that possible when using a cartridge along the lines that Sylvan itself illustrates.

There are two entirely distinct reasons why the USPTO's assumption is wrong.

First, Sylvan is itself a patent and thus summarizes an earlier invention. It refers to a "high flow rate" exactly once: in the "summary" of what Sylvan and Dragone (i.e., the named inventors) themselves had invented. The second sentence of this section explains that "[i]t is a further object of this invention to provide such an improved beverage filter cartridge which is small and compact yet has a high flow rate." (Col. 1, lines 43-45).

Nothing in the entire document suggests that Sylvan and Dragone had recognized a problem, yet failed to solve it. On the contrary, I know from my own experience evaluating Keurig's older cartridges with "conical shaped" filters as illustrated in Sylvan that the cartridges I tested were small and compact, yet produced coffee in a minute or less. Indeed, this was a matter of public record.[13] In other words, the cartridges had achieved exactly what Sylvan and Dragone had set out to invent: a "beverage filter cartridge which is small and compact yet has a high flow rate."

At an even more fundamental level, the USPTO failed to appreciate that increasing flow rate while holding other variables constant is a recipe for failure. As explained in Section IV.C above, a critical factor in the coffee brewing process is the amount of time that the ground coffee spends in contact with the hot water. An increased flow rate would decrease coffee strength and/or extraction. This is exactly why my 1996 Coffee Brewing Handbook explains that a filter should preferably retard the flow of water to some extent, thereby facilitating "steeping" of the coffee rather than mere "rinsing." (p. 43).

Increasing the flow rate and thus decreasing the strength of the coffee would have been a particular problem for Keurig in 2003 at the time of the '925 invention. As noted above, I had previously worked with Keurig to evaluate its then-existing K-Cup portion packs, which I understand to correspond to the design illustrated in Sylvan. While those cartridges were quick and easy to use, the coffee itself was quite weak. Under those circumstances, increasing flow rate would have been the absolute last thing to do.

Professor Slocum's test results confirm my conclusions. Specifically, I understand from Professor Slocum that his second experiment involved compared fluted-filter cartridges as recited in the '925 application claims with conical-filter cartridges as illustrated in Sylvan.

The ten conical-filter cartridges brewed coffee with an average net TDS reading of 944 while taking a median time of 35 seconds. These figures are consistent with my recollections from my own evaluation of Keurig's conical-filter cartridges, which were being sold in 2003.

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[13] E.g., Tech Gifts are Hot for Holiday Gift-Giving, Albany Times Union, Nov. 3, 2003, at C2 (reporting that the Keurig B100 brewer used "sealed coffee capsules" and "turns out a cup faster than most of us can fill a kettle"); Michael Keighley, SCAA Annual Conference & Exhibition 2003, Gourmet Retailer, July 1, 2003 (reporting that Keurig K-Cups allow people to "brew coffee in less than a minute") ; Green Mountain Coffee will Market, Vending Times, Nov. 25, 2000 ("The K-Cup is used with the 'Keurig' coffee to prepare a single cup of coffee in 30 seconds."); Nancy Roberts, State of the Coffee Industry 2000, Specialty Coffee Retailer, June 2000 ("The Keurig system, which brews a fresh cup in just 30 seconds, can be an effective way to distribute specialty coffee in the office or convenience store or even gas station.").

They are also consistent with the results from Keurig's own testing at that time (K000126-29) as well as the reports in publicly-available literature, which touted the speed of Keurig's system. See note 13 above. The net TDS values, however – all under 1000 ppm – indicate that the coffee itself would not have been acceptable to many people brewing it at home.

Yet the ten fluted-filter cartridges, which for purposes of the comparison had exactly the same amount of coffee as the conical-filter cartridges even though they could in fact hold substantially more, yielded coffee with an even lower average net TDS of 902. The average brew time for the fluted-filter cartridges was also shorter – 28.7 seconds.

The individual results themselves reveal a notable correlation between brew time and net TDS:

Conical Filter Sample No.	Brew Time	Net TDS Value
4	30.0 seconds	896 ppm
2	30.8 seconds	896 ppm
6	31.6 seconds	934 ppm
10	32.0 seconds	924 ppm
9	32.0 seconds	961 ppm
7	35.6 seconds	923 ppm
8	35.6 seconds	958 ppm
5	38.0 seconds	994 ppm
3	42.4 seconds	971 ppm
1	43.2 seconds	985 ppm

Fluted Filter Sample No.	Brew Time	Net TDS Value
8	27.2 seconds	888 ppm
7	28.0 seconds	890 ppm
9	28.0 seconds	896 ppm
5	28.4 seconds	887 ppm
6	28.4 seconds	889 ppm
10	28.4 seconds	888 ppm
1	28.4 seconds	908 ppm
4	28.8 seconds	888 ppm
2	30.0 seconds	940 ppm
3	30.4 seconds	953 ppm

The shorter the brew time, the less of an opportunity the hot water has to extract flavor components from the interior of the roast and ground coffee particles (as opposed to simply "rinsing" the exterior). Achieving an appropriate contact time (as opposed to the quickest one physically obtainable) is a fundamental aspect of the brewing process, as I explain in Section IV.C above.

Tellingly, in fact, even the "slowest" conical-filter cartridge that Professor Slocum tested brewed coffee in 43.2 seconds – faster than the most desirable brewing time when using the fine grind that single-serve applications require. As noted in my 1996 Coffee Brewing Handbook, the correct brewing time when using a fine grind "ranges from 1 to 4 minutes" – a range that applies "regardless of the equipment used or the quantity being prepared." (pp. 30 and 43). Daswick likewise recommends that the filter "retain hot water for approximately 2 to 3 minutes." (Col. 2, lines 55-56).

With this knowledge in hand, people skilled in the art would have had no interest in modifying Sylvan's cartridge simply for the purpose of increasing flow rate.

When responding to Keurig's request for rehearing, the USPTO itself appears to have acknowledged that an increased flow rate would "reduce the contact time between the brew water and the coffee, reducing the strength of the coffee beverage produced." (K001140) In response, however, the USPTO simply reasoned that a person of ordinary skill "would have been led to employ the optimum number of flutes or pleats in the side wall of the filter used" so as to "obtain various desired strengths of the coffee beverages consistent with the desired tastes of consumers. (Id. at pp. 8-9).

Such a scheme would be completely impractical in the real world and thus be immediately rejected by anyone with actual experience in the beverage industry and beverage brewing processes. The USPTO appears to be postulating that artisans would have tried (1) to develop entire arrays of filters varying only in the number of flutes or pleats, then (2) to calibrate those filters so as to achieve the taste profiles desired by various different groups of consumers. For example, filters with 8 flutes might yield strong coffee with a TDS of 1300, while the 12-flute variety produces medium-strength coffee with a TDS of 1150 and the 16-flute model yields weaker coffee with a TDS of 1000. This convoluted approach would be much more cumbersome than simply adjusting other variables such as the brewing formula. Even ordinary consumers can vary coffee strength by altering the ratio of coffee to water. By contrast, no one is going to purchase – much less stock or manufacture – an entire set of closely related filters to suit varying tastes.

2. Sylvan Would Not Be Understood as a "Conventional" Coffee Brewer Means as of 2003

Separately, the USPTO wrongly assumes that a person of ordinary skill would have understood Sylvan as disclosing the sort of "conventional" brewer means to which Spiteri's fluted filter is directed:

- Spiteri Abstract ("The present invention relates to filters…inside a vessel of a conventional automatic drip beverage brewing apparatus, such as a percolating coffee maker[14]….")

- Spiteri Paragraph 21 ("The filter is geometrically configured in size dimension and configuration to be received within the interior [of] a conventional coffee brewer means such as an electric drip brewer.")

In attempting to defend its rejection despite Spiteri's focus on "conventional" coffee brewers, language, the USPTO reasoned that electric drip brewers are simply one example of "conventional coffee brewer means." (K001106). This itself is true. As explained in my 1996 Coffee Brewing Handbook and described in Section IV.D above, there are six conventional brewing methods. Automatic drip brewers are simply one way of performing one of these six methods. For example, one alternative is "pour-over" equipment for manual drip brewing. Such products would certainly have constituted "conventional coffee brewer means" in 2003.

By contrast, Sylvan does not describe "conventional" brewing. Instead, it describes an unusual brewing process that does not fall within any one of the six categories listed in the Coffee Brewing Handbook. In fact, there was nothing at all "conventional" about the Sylvan design as of 2003. Sylvan instead described a new brewing concept that borrowed (while ultimately being quite different) from both pressurized-infusion systems and conventional drip brewing. As a result, Sylvan's brewing method forced cartridge designers to confront various issues that had never been a concern with ordinary drip brewing. Artisans getting involved in this new field would therefore have discounted "conventional" designs such as Spiteri's. For example, Sylvan emphasizes the importance of keeping the filter walls away from the cartridge walls during the brewing process itself. (Col. 2, lines 3-7). By contrast, conventional brewing techniques involve the filter sitting in the brew basket and making contact with the sides. Indeed, a failure to maintain such contact can lead to water and/or coffee grounds passing into the brewed beverage without going through the filter. Spiteri disclosed a filter designed to solve this problem and thus minimize the risk of diluted and/or contaminated coffee when brewed using "conventional" methods. With Sylvan's non-conventional technology, however, there is no risk of dilution or contamination so long as the seal between the filter and the cartridge sidewalls maintains its integrity. For this reason, Spiteri's filter design would not have interested typical artisans considering Sylvan's brewing system even if Spiteri said nothing about the filter contacting the sides of the brew basket. The fact that Spiteri does in fact emphasize such contact is yet another reason why artisans would have avoided combining Sylvan with Spiteri and thus why the USPTO is mistaken to conclude that '925 claims 1-9, 12-19, and 22-44 would have been obvious.

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[14] As explained in Section IV.D above, percolators certainly are not automatic drip machines. The brewing techniques are fundamentally different, and Spiteri's failure to appreciate the distinction would have given people skilled in the art ample reason to brush aside the Spiteri reference as a whole. Percolators pass water through the coffee grounds many times and thus result in undesirable complete extraction. By contrast, drip machines pass water through the coffee bed a single time. This can produce quality coffee if other variables are properly controlled.

I, Ted R. Lingle, submit this report pursuant to Fed. R. Civ. P. 26(a)(2). I may adjust my analysis in light of the views offered by the USPTO (or its expert witnesses) or based on information that is provided to me in the future.

I declare under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge and belief.

Dated: July 7, 2011

Ted R. Lingle

Exhibit A – Materials Considered

Publications:

Timothy J. Castle, Coffee: Then and Now…, Tea & Coffee Trade Journal, Vol. 175/No. 8 (Aug./Sept. 2001)

Green Mountain Coffee will Market, Vending Times, Nov. 25, 2000

Michael Keighley, SCAA Annual Conference & Exhibition 2003, Gourmet Retailer, July 1, 2003

Ted R. Lingle, The Coffee Brewing Handbook (1st ed., 1996)

Nancy Roberts, State of the Coffee Industry 2000, Specialty Coffee Retailer, June 2000

Tech Gifts are Hot for Holiday Gift-Giving, Albany Times Union, Nov. 3, 2003

Joe Yonan, Brew-by-Cup Coffee Makers Fail Taste Test, Boston Globe, Dec. 11, 2003, at H3

Patent-Related Materials:

'925 File History (K000606-1141)

U.S. Patent No. 3,389,650 to Michielsen (K000452-455)

U.S. Patent No. 3,971,305 to Daswick (K000456-462)

U.S. Patent No. 5,325,765 to Sylvan and Dragone (K000589-596)

U.S. Patent No. 6,007,853 to Lesser (K103493-505)

U.S. Patent No. 6,645,537 to Sweeney (K000443-451)

U.S. Patent No. 6,602,410 to Tanner (K103523-539)

PCT Publication No. WO 91/14389 by Frise (K000796-808)

U.S. Patent Application Publication No. 2002/0185010 by Spiteri (K00582-588)

Documents from Keurig:

Beverage Solids Concentrations (electrical conductivity) of Peet's House Bld, Caribou Coffee's Caribou Bld, & Caribou Coffee's Decaf Caribou Bld from hand-made K-Cups & M-cups compared to prodn Grn Mtn K-Cups (K000120-125)

Beverage Electrical Conductivity, Brew Pressure, Brew Duration -- on a B2000 Peet's, Starbucks, & Seattle's Best coffee in long-fluted-fliter K-Cups compared to std K-Cups (K000126-129)

Packaging Engineering and K-Cups, July 29-30, 2003 (K000249-260)

Fiscal Year 2008 Royalties (K001203-1207)

Sales of Coffee/Espresso Makers Jan-2007 – Dec-2010 (K001541-1567)

Other Materials and Sources:

Discussions with Professor Alexander Slocum

May 3, 2011 Testing Photographs and Videos (SLOCUM0001-33)

May 3, 2011 Testing Results (SLOCUM0040)

Exhibit B – Publications

Books:

The Basics of Brewing Coffee (1996)

The Basics of Cupping Coffee (3d ed. 2001)

The Coffee Brewing Handbook (1996)

The Coffee Cupper's Handbook (3d ed, 2001)

Articles:

I frequently publish articles in various trade journals. Because I do not maintain a formal record of all my publications, the following list may be incomplete. I have listed all of the articles that I can presently recall.

"Moving forwards into the new millennium," Tea & Coffee Trade Journal (Apr 1, 1999)

"Reflections on a Busy Year at SCAA," Tea & Coffee Trade Journal (Apr 20, 2001)

"A coffee pilgrimage to India," Tea & Coffee Trade Journal (May 1998)

"State of the specialty coffee industry: with such a rich and prolific history, the coffee industry has certainly seen its fair share of ebbs and flows…," Tea & Coffee Trade Journal (July 1, 2007)

"A cupping competition: Kona style," Tea & Coffee Trade Journal (Nov. 1992)

"Jointly crafting solutions," Tea & Coffee Trade Journal (Apr 20, 2003)

"The best is yet to come," Tea & Coffee Trade Journal (Apr 1, 1994)

"In Search of Standards, Ethics, and Education," Tea & Coffee Trade Journal (Jan 1, 1996)

"Coffee Cupping: the Key to Quality," Flavor & the Menu (2000 ed.) (www.flavor-online.com)

"Creating a Viable Future for Robusta," Coffee & Cocoa International (May 2011)

Exhibit C – Expert Testimony at Trial or by Deposition in Last Four Years

Gene R. Lorenz v. Valley Foods Service (Washington Case #06-2-10199-1, Pierce County Superior Court) – April 2007

Keurig, Incorporated v. Kraft Foods Global, Inc. et al (U.S. District Court for the District of Delaware, Civil Action No. 07-017) – June 2008

Casebolt v. McDonalds Corporation (4th District Court, Idaho) – February 2010